EXAMINER'S STATEMENT OF REASONS FOR ALLOWANCE

Response to Amendment

1. This action is responsive to applicant's amendment and remarks received on 12/3/04. Claims 1-31, 33-39 are currently pending.

EXAMINER'S AMENDMENT

2. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Franco Serafini (Reg #: 52,207) on 10/30/09.

The application has been amended as follows:

1. (currently amended) A method for encoding pixels of ~~digital or~~ digitized images~~,~~ comprising: ~~i.e.~~ providing one or more images ~~consisting of~~ comprising a set of image dots, named pixels in two-dimensional images and voxels in three-dimensional images, each of said pixels or voxels being represented by a set of values which correspond to a visual aspect of the pixel on a display screen or in a printed image, characterized in that the pixels (5) or voxels ~~(5, 14)~~ (14) of at least one portion of interest of the digital or digitized image or each pixel (5) or

voxel ~~(5, 14)~~ (14) of the set of pixels or voxels which form the image is uniquely identified with a vector whose components are given by the data of the pixels (5) or voxels to be encoded ~~(5, 14)~~ (14) and by the data of at least one or at least some or of all of the pixels (1, 2, 3, 4, 6, 7, 8, 9; 1, 2, 3, 4, 5,6, 7, 8, 9, 10, 11, 12, 13, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27) around the pixels to be encoded and arranged within a predetermined subset of pixels or voxels included in the whole set of pixels or voxels which form the image.

2. (currently amended) An encoding method as claimed in claim 1, characterized in that the components of the pixel (5) or voxel ~~(5, 14)~~ (14) identifying vector are determined by selecting, as pixels or voxels surrounding the pixel to be identified, all the pixels or voxels (1, 2, 3,4, 6, 7, 8, 9; 1, 2, 3,4, 5, 6 7, 8, 9, 10, 11, 12, 13, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27) that are directly adjacent to said pixel or voxel to be encoded.

3. (currently amended) A method as claimed in claim 1, characterized in that the components of the identification vector of a pixel (5) or voxel to be encoded ~~(5, 14)~~ (14) also consist of at least one or at least some or at least all of the pixels or voxels surrounding the pixels or voxels (1, 2, 3, 4, 6, 7, 8, 9; 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27) that are directly adjacent to said pixel (5) or voxel to be encoded ~~(5, 14)~~ (14).

4. (currently amended) A method as claimed in claim 1, characterized in that the components of the identification vector, corresponding to the pixel (5) or voxel to be encoded ~~(5, 14)~~ (14) and to the surrounding pixels or voxels (1, 2, 3, 4, 6, '7, 8, 9; 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27) are arranged in such a manner as to

correspond to the distance relation of said pixels or voxels (1, 2, 3, 4, 6, 7, 8, 9; 1,2,3,4,5,6,7,8,9, 10, 11,12, 13, 15, 16~~,~~ 17, 18, 19,20,21,22,23,24,25,26, 27) with one another and with the pixel (5) or voxel to be encoded ~~(5, 14)~~ (14), with reference to a predetermined reading sequence of surrounding pixels or voxels (1, 2, 3, 4, 6, 7, 8, 9; 1, 2, 3,4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27), selected for forming said identification vector and the pixel (5) of voxel to be encoded ~~(5, 14)~~ (14).

5. (currently amended) A method as claimed in claim 1, characterized in that the components of the identification vector are arranged in such a manner that the pixel (5) or voxel to be encoded ~~(5, 14)~~ (14) has a central position which corresponds to the one taken in the image pixel or voxel set, ~~obviously as~~ related to the pixels or voxels (1, 2, 3, 4, 6, 7, 8, 9; 1, 2, 3, 4, 5, 6, the pixel (5) or voxel to be encoded~~. (5, 14)~~ (14) which have been selected for determining the identification vector components.

6. (currently amended) A method as claimed in claim 1, characterized in that it includes the step of encoding a sequence of digital or digitized images of a single subject and relating to a single frame of said subject, which sequence includes at least two images acquired with a time interval therebetween, which identification vector for a pixel (5) or voxel~~. (5)~~ (14) to be encoded, having the same position in the pixel matrix which forms said sequence images, is formed by the value of said pixel (5) or voxel to be encoded ~~(5)~~ (14) and by the surrounding pixels or voxels selected to form the components of said identification vector for each image that is part of said image sequence.

7. (currently amended) A method as claimed in claim 6, characterized in that the

identification vector for a pixel (5) or voxel to be encoded ~~(5)~~ (14) within a sequence of digital or digitized images includes the values of said pixel or voxel to be encoded and of the pixels or voxels selected to form the components of said identification vector of all the images of said sequence, the values of the pixel (5) or voxel ~~(5)~~ (14) to be encoded and of the pixels or voxels around it, selected to form the components of the identification vectors, being ordered with respect to the instant whereat the individual images of the sequence were acquired, in such a manner as to form subsets of identification vector components, referred to the same image of the image sequence or to the same acquisition instant.

9. (Currently Amended) A method of processing digital or digitized images, operating based on image pixel or voxel encoding as claimed in claim 1, and characterized in that it includes generation of a teaching database and teaching of the processing system, including the following steps:

- ~~Encoding~~ encoding a predetermined number of digital or digitized images into pixel or voxel identifying vectors;
- uniquely associating each identification vector to the corresponding type of object or to the corresponding quality, as determined by traditional image analysis and actually reproduced by each pixel or voxel encoded by the corresponding identification vector, with reference to a list of predetermined different types or qualities~~.~~
- ~~Generating~~ generating a teaching database for a processing system, which database comprises the binomials formed by said identification vectors and by the associated

type or quality of the object reproduced by the corresponding pixel or voxel;

- ~~Actually~~ actually teaching the processing system, by entering and loading the teaching database therein or by allowing the processing system to access the database;

- ~~A~~ a repeatable processing step for different images or image sequences with no need to repeat the teaching step, and comprising the following steps:

- ~~Encoding~~ encoding the pixels or voxels of a not otherwise evaluated image by identification vectors associated to each pixel or voxel;

- ~~Entering~~ entering said image pixel or voxel identifying vectors in the processing system to obtain, at the output of said processing system and as a result of the processing, the type or quality of the object represented by each image pixel or voxel, with reference to the object types or qualities included in the teaching database.

13. (Currently Amended) A method as claimed in claim 9, characterized in that the pixels or voxels of the processed image wherefor an object type or quality has been recognized are displayed differentially from each other and 'from the image~~, e.g. thanks to a certain aspect, like a predetermined different color or the like~~ for each object type or quality option.

14. (Currently Amended) A method as claimed in claim 13, characterized in that the pixels or voxels of the processed image wherefor an object type or quality has been recognized are displayed differentially from each other and from the image~~, e.g. thanks to a certain aspect, like a predetermined different color or the like~~ for each object type or quality option, and over the original image.

25. (Currently Amended) A method as claimed in claim 9, characterized in that it is a method for measuring contrast agent perfusion, wherein a sequence of ultrasound or Nuclear Magnetic Resonance images of a predetermined anatomic part of a patient are detected after injecting so called contrast agents in said anatomic part, which method includes the following steps:

- ~~Generating~~ generating a teaching database for the expert processing system comprising identification vectors for pixels or voxels or image sequences obtained when contrast agents are present, whereto a quality or type o perfusion behavior is associated, among different typical perfusion types or qualities;
- ~~Actually~~ actually teaching the processing system, by entering or handling data of the teaching database;
- ~~Acquiring~~ acquiring a sequence of images of an anatomic part after injecting contrast agents therein, and encoding the pixels or voxels of the images of said sequence, into identification vectors for the pixels of said image sequence;
- ~~Processing~~ processing by the identification vector processing algorithm, which associates, based in the teaching database, a perfusion behavior type or a perfusion quality to each identification vector, hence to each pixel or voxel of the image sequence;
- ~~Displaying~~ displaying the image sequence, and highlighting the pixels or voxels associated to the different perfusion behavior qualities or types by means for unique visual aspect characterization of said pixels or voxels.

26. (Currently Amended) An image processing method as claimed in claim 9, which includes an image pixel or voxel encoding method, characterized in that it is a method for recognizing and displaying parts of moving organs or physiological structures, particularly of the heart, wherein a sequence of ultrasound or radiographic or Nuclear Magnetic Resonance images of the heart or of any other organ or physiological structure is acquired, which method includes the following steps:

- generating a teaching database in which each identification vector for pixels or voxels of a. plurality of image sequences of the heart or any other organ or physiological structure is assigned the type or quality of what is reproduced by the corresponding pixel or voxel;
- ~~Actually~~ actually teaching the processing system, by entering or handling data of the teaching database;
- ~~Encoding~~, encoding a sequence of images of the heart or any other organ or physiological structure for further processing;
- ~~Processing~~ processing said encoded sequence of images so that the processing algorithm may assign, based on the teaching database, the type or quality reproduced by each pixel or voxel of the encoded image sequence;
- displaying the result and visually highlighting the pixels of voxels corresponding to specific types or qualities by uniquely changing the aspect of these pixels of voxels according to each of the specific types or qualities.

27. (Currently Amended) A method as claimed in claim 9, wherein the following steps are included:

- generating a teaching database by encoding image pixels or voxels into identification vectors, and wherein each identification vector for the pixels or voxels of said images is assigned the type or quality which defines the presence or absence of the image defect or aberration depending on whether the corresponding pixel or voxel reproduces or has or not said aberration or said defect;

- ~~Actually~~ actually teaching the processing system, by entering or handling data of the teaching database;

- ~~Encoding~~ encoding images;

- ~~Processing~~ processing said encoded images so that the processing algorithm may assign, based on the teaching database, the type or quality which defines the presence or absence of an image defect or aberration for each pixel or voxel of the encoded images;

~~Displaying~~ displaying the result and visually highlighting, by aspect change arrangements, the pixel/s or voxel/s which have been assigned the type which defines the presence of aberrations or defects and possibly indicating the quality of the aberration or defect assigned to a pixel or voxel, as distinct from the one assigned to other pixels or voxels, by further aspect differentiation of the pixel/s or voxel/s, uniquely related to the different defect or aberration qualities.

28. (Currently amended) A method as claimed in claim 27, characterized in that it further includes defect removal, according to the following steps:

- ~~Adding~~ adding to the teaching database pairs of encoded images, which have or do not have image defects or aberrations, by associating the identification vectors with the corresponding types defining the presence or absence of pixel aberration;

- ~~Encoding~~ encoding the pixels or voxels of an image and processing the latter to

assign the type that defines the absence of presence of aberrations or defects, and possibly the quality of said aberrations or defects to each pixel or voxel of the image;

- ~~Correcting~~ correcting the aspect of the pixels ~~of~~ or voxels which have been found to have defects or aberrations by assigning them the aspect of the defect- or aberration-free pixels or voxels of the image, which is coupled, in the teaching database, to the corresponding image which has said aberrations or defects.

29. (Currently Amended) A method as claimed in claim 27, characterized in that the processed images are previously or subsequently processed for specific recognition of the object types represented~~.~~ by the pixels.

31. (Currently Amended) A method as claimed in claim 9, characterized in that it is a method of overlaying digital or digitized images of the same subject, obtained by different imaging techniques, which includes the following steps:

- ~~Encoding~~ encoding each of the images of the same subject, obtained with different imaging techniques,

- ~~Processing~~ processing each of the images of the same subject, obtained with different imaging techniques, for recognizing types of objects or qualities;

- ~~Combining~~ combining the information provided by the pixels of the different images, which are assigned to the same type of object, into a single image.

32. (cancelled)

40. (cancelled)

Allowable Subject Matter

3. Claims 1-31, 33-39 (to be re-numbered as 1-38) are allowed.

4. The following is an examiner's statement of reasons for allowance:

Regarding claim 1, the most relevant prior art of record teaches providing one or more images comprising a set of image dots, named pixels in two-dimensional images and voxels in three-dimensional images, each of said pixels or voxels being represented by a set of values which correspond to a visual aspect of the pixel on a display screen or in a printed image.

Applicant's claimed invention distinguishes over the prior art of record by characterized in that the pixels (5) or voxels (14) of at least one portion of interest of the digital or digitized image or each pixel (5) or voxel (14) of the set of pixels or voxels which form the image is uniquely identified with a vector whose components are given by the data of the pixels (5) or voxels to be encoded (14) and by the data of at least one or at least some or of all of the pixels (1, 2, 3, 4, 6, 7, 8, 9; 1, 2, 3, 4, 5,6, 7, 8, 9, 10, 11, 12, 13, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27) around the pixels to be encoded and arranged within a predetermined subset of pixels or voxels included in the whole set of pixels or voxels which form the image.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to EDWARD PARK whose telephone number is (571)270-1576. The examiner can normally be reached on M-F 10:30 - 20:00, (EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Samir Ahmed can be reached on (571) 272-7413. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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